Maria Kaya

Essays on Diffusion and Repeat Sales of Consumer Durables – A Study of the Consumer Electronics Market

Betriebswirtschaftliche Aspekte lose gekoppelter Systeme und Electronic Business

Herausgegeben von

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In der Schriftenreihe werden Ergebnisse von Forschungsarbeiten veröffentlicht, die sich in herausragender Weise mit Fragen des Managements lose gekoppelter Systeme, virtueller Unternehmen und elektronischer Geschäftsprozesse beschäftigen. Die Reihe richtet sich an Leser in Wissenschaft und Praxis, die Anregungen für die eigene Arbeit und Problemlösungen suchen. Sie ist nicht auf Veröffentlichungen aus den Instituten der Herausgeber beschränkt.

Essays on
Diffusion and Repeat Sales of Consumer Durables – A Study of the Consumer Electronics Market

Inaugural-Dissertation zur Erlangung des akademischen Grades eines
Doktors der Wirtschafts- und Sozialwissenschaften der
Wirtschafts- und Sozialwissenschaftlichen Fakultät
der Christian-Albrechts-Universität zu Kiel

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Kiel, 2007

Gedruckt mit Genehmigung der
Wirtschafts- und Sozialwissenschaftlichen Fakultät
der Christian-Albrechts-Universität zu Kiel

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Tag der Abgabe der Arbeit:	3. Dezember 2007
Tag der mündlichen Prüfung:	17. März 2008

Foreword

This doctoral thesis was funded by a scholarship granted by the post graduate program of the German Research Foundation (Deutsche Forschungsgemeinschaft): “Business Aspects of Loosely Coupled Systems and Electronic Business.” This allowed me the opportunity to conduct my research under excellent conditions.

This dissertation is concerned with the field of diffusion of innovations with a particular focus on repeat sales of consumer durable goods. Despite the fact that repeat purchases dominate overall sales of consumer durables, they have received far less attention in the literature compared to first purchases of new products. I first have to thank the hundreds of companies and universities who hosted my survey on their websites making it possible to collect a sample of more than 8,000 German households. This large data set allowed a detailed investigation of the differences between households in terms of their repeat purchase behavior of consumer electronic products. The findings of the three empirical studies of this thesis will help companies to better understand the drivers and timing of repeat purchases, to segment households in a more insightful way and to forecast repeat sales of durable goods more accurately.

My PhD has been an intriguing journey. I once met a doctoral student at a workshop who said: “You know, I feel pregnant with my thesis. If my baby develops well, I feel happy. But sometimes it makes me feel nauseous. As soon as you get ‘thesis pregnant’ there is no escape until finally your baby is born.” Many people helped me feel less nauseous during my pregnancy as a doctoral student. Sincere thanks go to various people from all over the globe who contributed to the success of this work.

I am very grateful to have had a fantastic supervisor like Prof. Dr. Dr. h.c. Sönke Albers. He is one of the best mentors one could hope to get as a PhD student. He inspired me to dive into the exciting world of research. He is an outstanding academic and moreover a wonderful human being. I found he takes exceptional care of his PhD students. I will always be deeply thankful for his support and his contribution to my research and life.

I thank Prof. Dr. Joachim Wolf for his position as the second examiner of my thesis. I am grateful for the speed with which he delivered his report.

I would love to thank Prof. Birgit Friedl for her role as the chairwomen during my oral defense. She is a great person who showed genuine interest and understanding of my research.

Another big thanks goes to Lisa, a valuable staff member at the International Center, who provided me with support during my work as the Erasmus coordinator of the Business School. The International Center bade me farewell in style, hosting a lovely dinner and giving me a memorable gift. I also owe great thanks to Kirsten, a terrific student, for her assistance in my second year at the Business School.

A highlight of my PhD was my stay at the Queensland University of Technology in Brisbane as a visiting scholar. I had the wonderful opportunity to work with Prof. Dr. Paul Steffens who acted as a second supervisor. We ended up collaborating together on several projects. Like Sönke Albers, Paul Steffens inspired my interest in research. He provided exemplary support to me during my academic stay abroad. I would like to thank him for the chats we had over many hours about research, papers, the difference between Australian and German football, very good German bread versus not so very good Australian bread etc. I am grateful for the funding provided by the Queensland University of Technology for attending further conferences and workshops. Many thanks to Prof. Dr. Evan Douglas, the former head of school, and research director Prof. Dr. Per Davidsson. The time spent in Australia was memorable, not only for my thesis.

Importantly, I must also mention the friendly and vibrant atmosphere provided by my colleagues and friends, both at the department of Innovation, New Media and Marketing and at other departments. Just to mention a few of the people who supported me and made this special time unforgettable: Markus, Jörn, Jan, Sina, Marc, Anne, Martin, Christian and Dirk. Our previous and current secretaries Mrs. Hinz and Mrs. Hahn-Mieth helped me out with a lot of administrative work, which was always a great relief. Also, the interesting chats were a highly welcome distraction from the unsolved problems of my thesis at any given time.

I would like to thank my co-authors on the papers of this thesis, Prof. Dr. Dr. h.c. Albers, Prof. Dr. Steffens and Dennis for the great collaboration. These papers as well benefited from the fantastic support of very competent students like Sonja, Jan and Andrea. Our fabulous Hiwi Thomas helped out with all kind of IT issues.

I’ll never forget the fun I had with previous and current colleagues of the German Research Foundation during our seminars in Sehlendorf, which have become

legendary over recent years. I am thankful for the excellent, sometimes painful feedback I received about my research presented at those seminars. It was somewhat like going to a nice dentist. I also enjoyed the refreshing doctoral seminars of Prof. Dr. Rolf A. E. Müller at the Institute for Agricultural Economics and the illuminating doctoral colloquium offered by the consultant company Simon - Kucher & Partners in Bonn.

Last but not least, I truly want to thank my family and my few close friends outside university: my father who has been a great support, himself a PhD veteran; my mother who wrote me lovely letters from time to time to boost my waning motivation towards the end of my thesis; my sister who had to remind me regularly that the world is not only about diffusion of innovations, repeat purchases, consumer innovativeness, durables, distributions, parameter estimates, good fits and so on. I did spend more time in the office and in front of my computer than with them. Thinking back, I feel sorry for this and highly appreciate their amazing support and understanding. I would love to thank Sassan for his patience and helpful feedback about draft versions of numerous presentations. Finally, one of my greatest thanks goes to Sandro - my angel. I would never have finished my PhD without his overwhelming support throughout my entire PhD time. My gratefulness to you is boundless.

Looking back at my PhD time I can say I learnt a hell of a lot. This special time with all its ups and downs is really not comparable to anything else. Or to express this in the words of Prof. Dr. Dr. h.c. Jürgen Hauschildt: “A doctoral thesis is a unique experiment. It is equivalent to an odyssey. And one day - after many trials and errors - you will finally find the right exit and will reach your goal.”

The outcome of my unique experiment is dedicated to my family, friends and my supervisor Sönke Albers.

Maria Kaya
(Any queries or feedback about this work please email 2mariakaya@gmail.com)

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Synopsis

1 Importance of Repeat Purchases Research for Consumer Durables

Companies like IBM, Philips and GE spend billions of dollars every year to develop and launch new, innovative products. This is a very high-risk activity. Failure rates for new consumer durable goods lie between 60% - 70% of the products introduced into the market (Boulding, Morgan and Staelin 1997). Clearly, with this much at stake, companies need to maximize their returns for those products that are successful. This can only be achieved if the potential of repeat sales is captured, since they account for between 70% - 75% of total sales over the product's lifecycle (Bayus and Gupta 1992).

Despite this important role of repeat purchases, literature on the diffusion of innovation has been dominated by work on first purchase adoptions (Bass 1969; Mahajan, Muller and Wind 2000; Rogers 1962). Moreover, that research has largely been limited to studies of aggregate sales patterns (e.g. Kamakura and Balasubramanian 1987; Olson and Choi 1985; Steffens 2003). Only a handful of studies have empirically examined repeat purchases at the household level.

Yet it is vitally important for consumer durable marketers to understand the nature of consumer behavior, factors that drive sales, and differences between households. This is because managers are faced with several challenges when designing marketing campaigns for repeat purchasers of consumer durables. First, since marketers have little impact on the timing of forced replacements due to failure, it is important to know which consumers are likely to make discretionary replacements of working units or purchase additional units. Second, once these customers are identified, the interest shifts to understanding how to entice them to purchase earlier. Here, a clear understanding of the drivers of repeat purchases provides useful insights. Third, as durable goods are relatively expensive and purchased infrequently, it is vital to find "the right person at the right time".

The aim of this doctoral thesis is to contribute to our understanding of repeat purchases of consumer durables at a household level - a clearly under-researched

area. Towards this aim, a large-scale survey of German households was conducted. The survey examined the buying behavior for six consumer electronic products: TVs, VCRs, PCs, notebooks, digital cameras and DVD players.

2 Overview

Three research streams related to repeat purchases can be identified in the field of diffusion of innovation literature. The first stream is aggregate sales research that develops models of total product sales using first and repeat purchase components, and the impact of marketing mix variables such as price and advertising. These models can be used to forecast sales and evaluate the effectiveness of marketing efforts. The second research stream examines repeat purchases at a disaggregate (household) level. The purpose of this type of research is to understand differences between households in order to both predict when they are likely to purchase and design campaigns to encourage consumers to purchase more. The third stream, product life cycle (PLC) research, applies insights from the first two streams to understand sales patterns over time and develop managerial guidelines for managing a product over the course of its lifecycle.

This doctoral research makes contributions to each of the three research streams as summarized in Figure I.
Within the household-level repeat purchasing behavior stream, the unique survey data collected allowed three topics to be investigated for the first time:

- the role of consumer innovativeness as a driver of repeat purchases (for both replacements and additional unit purchases),
- distinguishing between replacements forced by product failure and discretionary replacements of working units,
- the explicit examination of purchases of additional units.

Within the aggregate sales modeling stream, again, the unique data enables a differentiation between forced and discretionary replacements for the first time. This insight has implications for three aspects of these models:

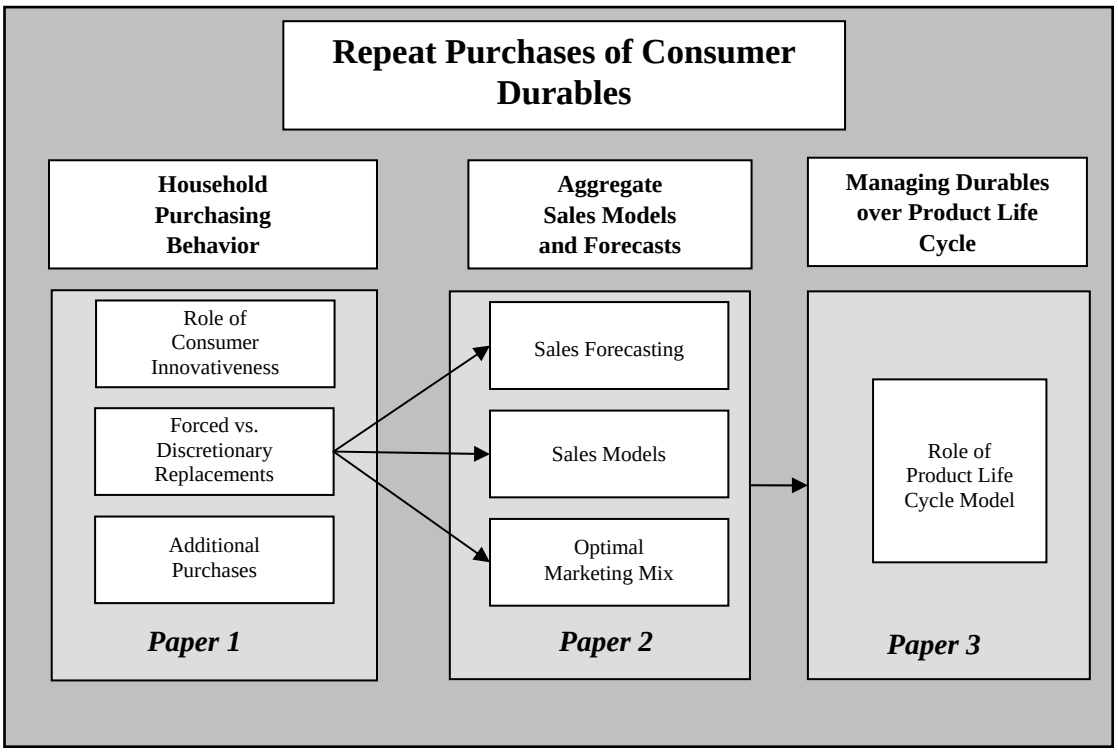
- more accurate sales forecasting,
- enhancing sales models to better represent the underlying consumer behavior,

- improved understanding of the impact of marketing mix variables (such as price and advertising) and optimal policies to maximize profits.

Finally, this doctoral work integrates the findings from both the household purchasing analysis and aggregate sales modeling to develop a refined model of the product lifecycle.

As indicated in Figure I, a separate paper has been developed based on the contribution to each of these three research streams. In addition, two articles have been written on method issues related to the empirical survey. Each of the papers are summarized in the following section.

Figure I: Relationship between Papers



3 Data and Sample

Because of their long lifetimes, durable goods tend to be purchased infrequently. Unfortunately, a data collection system like supermarket-scanner data for packaged goods (non-durable goods) is not yet available for durable goods. Many earlier studies of repeat purchases have limited generalizability because they only study

one product, as well as low statistical power due to sample size restrictions. Hence, an online survey was conducted to generate a large, diverse sample across products and households (the advantages and disadvantages of online surveys are discussed in ***Paper 4***). The sample included all regions of Germany and was reasonably representative of the population in terms of age and income (sample selection and design is further discussed in ***Paper 5***). The survey measured household purchase behavior for six consumer electronic products, ultimately gathering comprehensive data for each of the six products for a very large sample of 8,077 households. The survey is displayed in Appendix I.

The survey was hosted on 178 web sites for up to three months, and covering a diverse range of content in order to ensure broad-based internet exposure across Germany. This required the cooperation of over 100 companies and several universities. Respondents were encouraged to participate by stressing both the importance of this research and the value of their contribution. A personalized response summary was offered. Extrinsic rewards were also offered (prizes included DVD players, digital cameras, USB sticks, and notebook bags).

In total, the survey homepage was visited by 42,737 individuals (unique IP addresses). 13,495 respondents completed the survey, but of these, 3,139 failed consistency checks. This resulted in 10,356 completed surveys, representing 24.2% of those who visited the site. We later eliminated 1,721 respondents who were not the primary purchasing decision-maker for electronic products in the household (see discussion in next section) and 558 non-residents of Germany (tourists, international exchange students, etc.) resulting in the final sample of 8,077 useable responses.

The survey examined the respondent's purchasing behavior for six electronic products: TVs, VCRs, DVD players, digital cameras, laptops, and desktop PCs. We decided to confine our investigation to electronic products as these products have high numbers of each purchase type: forced, discretionary replacements, and additional purchases. The final selection of six products was based on the results of a pre-test of 99 durables including all products used in previous repeat purchase studies (see Table I), and on eleven criteria. Most importantly, it was essential to choose related products in order to allow innovativeness to be measured at a domain-specific level (Gatignon and Robertson 1985; Goldsmith and Hofacker 1991). Other criteria included: products of sufficient interest to diverse segments of

the general population; high purchase involvement; reasonably high average product knowledge; high average levels of repeat purchases.

We adapted exiting measures, and four pre-tests were used to refine the scales. The first pre-test involved a mail survey of 90 households with a telephone follow-up. The focus of this pre-test was to elicit feedback regarding the ease of comprehension and response to the questions, and question order. After completing the mail survey, all participants were called to thoroughly discuss each questionnaire item. One important insight from this pre-test was that only the primary decision-maker for electronic product purchases could accurately recall the timing of purchases of the six products. The second pre-test was conducted to select the products discussed above.

The third pre-test was an internet survey and follow-up telephone interview of 30 households. The purpose was to identify how households best recall the timing of past purchases. Earlier studies (e.g. Bayus and Mehta 1995; Grewal, Mehta and Kardes 2004) directly asked consumers for the age of products they replaced. Our pre-test identified that people first remembered the year of the repeat purchases and then, in the second step, calculated the age of the product. Hence, a more reliable measure was to ask for the year in which a purchase was made. The final pre-test also involved an internet survey, this time of 372 households. The main purpose of this survey was to refine the measures in the survey instrument.

To measure inter-purchase intervals, we adapted the two-step procedure of Bayus and Mehta (1995). We conducted an initial pre-test mail survey of 90 households with a telephone follow-up to elicit feedback regarding comprehension and ease of response for each item. Bayus and Mehta (1995) asked consumers directly if consumers had made a replacement or additional purchase, and if so, the age of products they replaced. Once again, our pre-test identified that people first tried to recall the year of each purchase and, in the second step calculated the age of the product. Therefore, a more reliable measure was to directly ask for the year in which purchases were made. Respondents also found it easy to recall the first purchase, as it often corresponded to a life event such as first job or marriage. Alternatively, the year of the product's introduction served as a useful event cue. Respondents could also recall the year of their most recent purchases well. With these two reference points (first purchase and most recent purchases), respondents

found the task of estimating the year of other purchases easier. Hence, we asked respondents to recall the year of all purchases of the product and identify all but the first purchase as replacement or additional. The refined instrument was further tested using an internet survey and follow-up telephone interview of 30 households. Another important insight gained from these pre-tests was that only the primary decision-maker for electronic product purchases could confidently recall the timing of purchases. Forced versus discretionary replacements were determined for the household's most recent replacement using the item by Bayus (1988).

The measure for consumer innovativeness was adapted from the domain-specific innovativeness (DSI) scale proposed by Goldsmith and Hofacker (1991). Product usage (PU) was measured by a single item (Park, Mothersbaugh and Feick 1994). Households were asked how often they use each product (if owned) on a three point scale. Calibration of high, medium, and low usage for each product were initially determined from secondary sources (gfu 2004) and confirmed in the pre-tests. We employed single items for gender, age (in years), household annual gross income (six brackets), and year of household foundation.

4 Contribution of Papers

4.1 List

Five papers are hereby submitted for the doctoral thesis. Papers 1 and 2 are empirical studies. Paper 3 is primarily a conceptual paper. Papers 4 and 5 are methodological articles.

Table I: Published Papers of Cumulative Doctoral Thesis

Household Repeat Purchasing Behaviour
Marketing Consumer Durables in Mature Product Categories – Do Innovators Matter? Maria Kaya, Paul Steffens, Sönke Albers and Dennis Proppe Published in: SSRN Working Paper Series, Paper 1142824. Available at: http://papers.ssrn.com/abstract=1142874
Aggregate Sales Models and Forecasts
Modelling Replacement Sales for Consumer Durables: Forced versus Discretionary Replacements Maria Kaya, Paul Steffens and Sönke Albers Published in: SSRN Working Paper Series, Paper 1142874. Available at: http://papers.ssrn.com/abstract=1142874
Managing Consumer Durables over their Life Cycle
Reconceptualizing the Product Life Cycle Concept – Lessons from Diffusion of Innovations Paul Steffens and Maria Kaya Published in: SSRN Working Paper Series, Paper 1142890. Available at: http://papers.ssrn.com/abstract=1142890
Methodological Issues
Verfahren der Datenerhebung Maria Kaya Published in: S. Albers, D. Klapper, U. Konradt, A. Walter and J. Wolf (Eds.): "Methodik der empirischen Forschung", 2nd edition, Gabler Verlag, Wiesbaden 2007, 49-64. **Möglichkeiten der Stichprobenbildung** Maria Kaya and Alexander Himme Published in: S. Albers, D. Klapper, U. Konradt, A. Walter and J. Wolf (Eds.): "Methodik der empirischen Forschung", 2nd edition, Gabler Verlag, Wiesbaden 2007, 79-88.

4.2 Marketing Consumer Durables in Mature Product Categories – Do Innovators Matter?

As mentioned above, sales in consumer durable goods categories are dominated by repeat purchases. Managers want to know: Which consumers can be encouraged to make earlier repeat purchases? When are they likely to purchase? What factors drive their purchases? Three contributions are made in this paper. First, it investigates whether consumer innovativeness, a crucial driver of first purchase adoptions, also influences repeat purchases. Second, the important step is taken to examine the differential impact of purchase factors between replacements forced by failure and discretionary replacements of working units. Third, the paper empirically explores additional unit purchases at a household level for the first time. A competing risks hazard approach is used to analyze the survey data. It is revealed that consumer innovativeness is a strong driver for the timing of both discretionary replacements and additional purchases. The strength of this effect varies between products and household types.

Overall, the findings indicate that durable goods managers should pay special attention to innovative consumers when marketing to repeat buyers. This paper sets out to improve our understanding of repeat purchase behavior of consumer durables in several ways. It extends diffusion research by delivering useful insights into research of repeat purchases: first, this study challenges conventional wisdom and argues that consumer innovativeness influences the timing of both discretionary replacements and additional purchases, and increases the likelihood of making additional purchases. These propositions are strongly supported by the empirical evidence gathered. Second, strong asymmetric effects of household characteristics and product-related behaviors on forced versus discretionary replacements are identified. Third, the paper investigates the impact of household characteristics on the likelihood and timing of additional unit purchases for the first time.

4.3 A New Approach to Modeling Replacement Sales for Consumer Durables: Forced versus Discretionary Replacements

Accurate modeling of replacements is important to forecast overall demand, particularly later in the product lifecycle when they dominate total sales. In

addition, knowing at what product age consumers are most likely to replace units is important for durable goods marketers in order to be able to target customers at the right time.

Many earlier studies have employed distributions such as Weibull and Truncated Normal to model and forecast annual aggregate sales. Yet only two earlier studies have directly tested against empirical distributions generated by using disaggregate-level household data (Bayus 1988; Kamakura and Balasubramanian 1987). The survey data employed for this doctorial thesis enables this test. Furthermore, the household-level data allows for distinction between forced replacements due to the failure and discretionary replacements of working units (Bayus 1988). This differentiation is important because the timing of forced replacements is largely determined by product reliability and durability, whereas discretionary replacements are driven by new product features, technology advances, and styling changes. Obviously, marketers want to influence discretionary replacement buyers and encourage them to replace earlier. Yet, this important distinction has not been examined in sales modeling literature.

Analysis of the survey data revealed that replacement rate distributions for forced versus discretionary replacements differed substantially. Existing replacement distributions were deficient when tested against the survey data. Therefore, a new distribution was developed based on a modified Gamma distribution.

By distinguishing between forced and discretionary replacements, and utilizing the modified Gamma distribution, three contributions are made. First, the modified Gamma distribution was shown to fit both the forced and discretionary replacement rate distributions much better than earlier models. Second, we examined the accuracy of sales forecasting by combining sales data with the survey data of household replacements. Third, a promotion response model was developed incorporating an asymmetric impact of marketing effort on forced versus discretionary replacements. This provides very interesting insights for managers when designing promotions to encourage consumers to replace older units.

4.4 Reconceptualizing the Product Life Cycle Concept – Lessons from Diffusion of Innovations

The Product Life Cycle (PLC) model has been a prominent marketing strategy and planning tool for over 30 years. Curiously, a close examination of the PLC reveals that it is remarkably silent regarding the consumer. Other than specifying a sales pattern, strategic marketing suggestions are mostly derived from propositions concerning competitive dynamics and market structure. This paper argues that further managerial insights can be gained by paying more attention to consumer dynamics. Drawing on the substantive body of work on diffusion models and theory, this study focuses on improving the PLC as a holistic, conceptual framework to guide marketing strategy over the course of the product's life. Confining its scope to consumer durable products, the paper defines a new four-phased PLC model: Innovative - Majority - Repeat - Substitute. This is based on the dominant underlying consumer trends during the lifecycle. New marketing strategy implications emerge. The model is operationalized by combining different diffusion models, thereby strengthening the theoretical foundations of the PLC model and providing a basis for identifying the timing of PLC transitions. An empirical illustration of the enhanced PLC model is presented based on the survey data.

4.5 Verfahren der Datenerhebung

This paper is intended to provide assistance in the choice of data collection methods. It evaluates the strengths and weakness of different data sources, and compares primary data collection methods. The paper contrasts observational versus survey, experimental versus non-experimental, and cross-sectional versus longitudinal methods. It compares survey data collection methods: internet, mail, personal interview, telephone, and observation. The methods are assessed using several criteria, such as data quality, degree of interview bias, flexibility, representativeness, and costs. Examples are provided to illustrate the trade-offs that occur in practice.

4.6 Möglichkeiten der Stichprobenbildung

The paper is a practical guide to sample design. It starts by discussing why samples are required and the criteria for their proper design. It emphasizes the importance of generating a representative sample, and describes and compares different methods of sample selection, using examples to illustrate how the techniques may be operationalized. The paper concludes by describing how to determine the appropriate sample size based on sampling theory, again using a practical example.

5 Conclusion

On the basis of a major empirical study of German households, Papers 1-3 all make substantial contributions to the existing body of knowledge on repeat purchases of consumer durables. They contribute to three areas: understanding household purchasing behavior, aggregate sales modeling, and a managerial model of the product lifecycle. Papers 4-5 provide a practical guide to two crucial aspects of conducting good empirical work: selection of the appropriate data collection technique and sample design.

A Marketing Consumer Durables in Mature Product Categories – Do Innovators Matter?

Maria Kaya, Paul Steffens, Sönke Albers and Dennis Proppe (2008): "Marketing Consumer Durables in Mature Product Categories – Do Innovators Matter?", SSRN Working Paper 1142824. Available at: http://papers.ssrn.com/abstract=1142824

Abstract

Sales in consumer durable goods categories are dominated by repeat purchases. Managers are particularly interested to know: Which consumers can be encouraged to make earlier repeat purchases? When are they likely to purchase? What factors drive their purchases? We, the authors, make three contributions towards answering these questions. First, we explore whether consumer innovativeness, a crucial driver of first purchase adoptions, also influences repeat purchases. Second, we argue that it is important to examine the differential impact of purchase factors between replacements forced by failure and discretionary replacements of working units. Third, we empirically explore additional unit purchases at a household level for the first time. In order to address these questions, we apply a competing risks hazard approach to information we gathered from a survey of the purchase behavior of 8,077 households for six durable products. We find that consumer innovativeness is a strong driver for the timing of both discretionary replacements and additional purchases, but not for forced replacements. We show the strength of this effect varies between products and household types. Overall, our results indicate that durable goods managers should pay special attention to innovative consumers when marketing to repeat buyers. We also find evidence of strong asymmetric effects of household characteristics between forced and discretionary purchases. For example, income acts to accelerate discretionary replacements, but leads to longer forced replacement times.

B A New Approach to Modeling Replacement Sales: Forced versus Discretionary Replacements

Maria Kaya, Paul Steffens and Sönke Albers (2008): “A New Approach to Modeling Replacement Sales: Forced versus Discretionary Replacements”, SSRN Working Paper 1142874. Available at: http://papers.ssrn.com/abstract=1142874

Abstract

Why is understanding replacement purchases of consumer durables so important? It is the sales of replacement units that will ensure their long-term success. Replacement sales account for more than 75% of total sales for many durables (Islam and Meade 2000). Thus, the accurate modeling of replacements is important to forecast overall demand, particularly later in the product lifecycle when they dominate total sales. In addition, knowing at what age consumes are most likely to replace units is important for durable goods marketers to target customers at the right time.

Diffusion researchers usually incorporate a replacement distribution such as Rayleigh, Weibull, Truncated Normal, and Gamma. While many studies have employed these distributions to model and forecast annual aggregate sales, only two earlier studies (Bayus 1988; Kamakura and Balasubramanian 1987) have directly tested against empirical distributions generated by using disaggregate-level household data. Furthermore, household replacements of consumer durables are either forced replacements due to the failure or discretionary replacements of working units (Bayus 1988). This distinction is important because the timing of forced replacements is largely determined by product reliability and durability, whereas discretionary replacements are driven by new product features, technology advances, and styling changes. Obviously, marketers want to influence discretionary replacement buyers and encourage them to replace earlier. Yet, this important distinction has not been examined in sales modeling literature.

To examine this differentiation, we conducted a large survey of the replacement behavior of 8,077 German households for six consumer electronic products. The analysis revealed that replacement rate distributions for forced versus discretionary replacements differed substantially. Also, existing replacement distributions were deficient when tested against the survey data. Hence, a new distribution was developed based on a Modified Gamma distribution.

By distinguishing between forced and discretionary replacements and utilizing the Modified Gamma distribution, three contributions are made. First, the Modified Gamma distribution was shown to fit both the forced and discretionary replacement rate distributions much better than earlier models. Second, we examine the accuracy of sales forecasting by combining sales data with the survey data of household replacements. Third, a promotion response model was developed incorporating an asymmetric impact of marketing effort on forced versus discretionary replacements. This provides very interesting insights for managers when designing promotions to encourage consumers to replace older units.

C Reconceptualizing the Product Life Cycle Concept – Lessons from Diffusion of Innovations

Paul Steffens and Maria Kaya (2008): “Reconceptualizing the Product Life Cycle Concept – Lessons from Diffusion of Innovations”, SSRN Working Paper 1142890. Available at: http://papers.ssrn.com/abstract=1142890

Abstract

The Product Life Cycle (PLC) model has been a prominent marketing strategy and planning tool for over 30 years. As a managerial tool, strategic insights are largely derived from the expected overall sales pattern and competitive dynamics. Curiously, with the exception of using adoption theory as the basis for the introduction and growth phase, the role of consumer behavior is overlooked. In this paper, we argue that further managerial insights can be gained by paying more attention to consumer dynamics. Drawing on the substantive body of work on diffusion models and theory, this paper focuses on improving the PLC as a holistic, conceptual framework to guide marketing strategy over the course of a product’s life. Confining its scope to consumer durable products, our paper defines a four-phased PLC model: Innovative → Majority → Repeat → Substitute, which is based on the dominant underlying consumer trends. New marketing strategy implications emerge. The model is operationalized by combining several diffusion models, thereby strengthening the theoretical foundations of the PLC model and providing a basis for identifying the timing of PLC transitions. An empirical illustration of the enhanced PLC model is presented.

D Verfahren der Datenerhebung

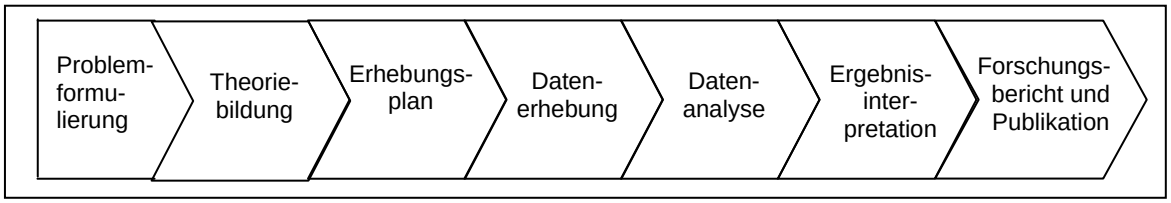
Maria Kaya (2007): Verfahren der Datenerhebung, in: S. Albers, D. Klapper, U. Konradt, A. Walter and J. Wolf (Eds.): "Methodik der empirischen Forschung", 2nd edition, Gabler Verlag, Wiesbaden 2007, 49-64.

Einleitung

Daten stellen die Grundlage eines empirischen Forschungsprojektes dar. Durch ihre Nutzung werden entscheidungsrelevante Informationen generiert. Unter dem Begriff der Datenerhebung wird die systematische und gezielte Aktivität zur Beschaffung von Informationen verstanden (Hammann und Erichson 2000, S. 81).

Jeder Forschungsprozess beginnt mit der Problemformulierung, aus der sich die Forschungsziele ableiten. Im nächsten Schritt erfolgt die Theoriebildung und gegebenenfalls werden die zu messenden Variablen und Konstrukte operationalisiert. Anschließend erfolgt die Festlegung des Erhebungsplanes, der die Auswahl des Erhebungsumfanges, der Erhebungseinheiten sowie der Methode der Datenerhebung beinhaltet. Den vierten Arbeitsschritt stellt der Prozess der Datenerhebung dar. Abbildung D-1 gibt einen Überblick über die einzelnen Prozesse, die im Rahmen eines empirischen Forschungsprojektes anfallen.

Abbildung D-1: Ablauf eines empirischen Forschungsprozesses



Quelle: Eigene Darstellung in Anlehnung an Böhler 2004, S. 30; Hammann und Erichson 2000, S. 68; Schnell, Hill und Esser 1999, S. 8

Im nächsten Kapitel soll ein Überblick über die gängigen Erhebungsmethoden gegeben werden.

E Möglichkeiten der Stichprobenbildung

Maria Kaya and Alexander Himme (2007): Möglichkeiten der Stichprobenbildung, in: S. Albers, D. Klapper, U. Konradt, A. Walter and J. Wolf (Eds.): "Methodik der empirischen Forschung", 2nd edition, Gabler Verlag, Wiesbaden 2007, 79-88.

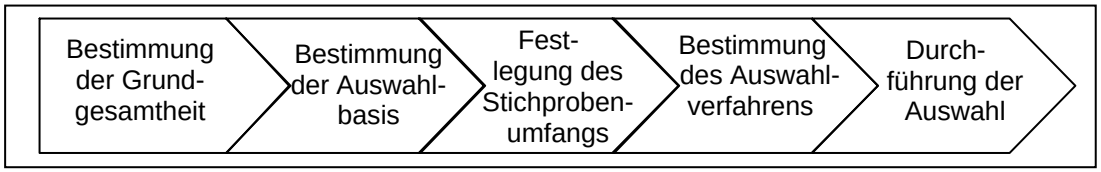
Notwendigkeit von Stichproben

Im Ablauf des empirischen Forschungsprozesses stellt sich nach der Festlegung der Datenerhebungsmethode und der entsprechenden Skalierung der zu untersuchenden Merkmale die Frage nach der Auswahl der Erhebungseinheiten, bei denen die Daten erhoben werden sollen. Diese Datenerhebung kann als Voll- oder Teilerhebung durchgeführt werden.

Bei der Vollerhebung (Zensus) wird jedes Element der Grundgesamtheit auf die interessierenden Merkmale hin untersucht. Aus statistischer Sicht stellt die vollkommene Abdeckung der Grundgesamtheit den Idealfall dar (Homburg und Krohmer 2003, S. 225). Die Vollerhebung kann jedoch nur in Betracht kommen, wenn die interessierende Grundgesamtheit relativ klein ist. Typische Beispiele für Vollerhebungen sind Befragungen im Industriegüterbereich (z.B. Anlagen- und Maschinenbau), da hier häufig nur eine geringe Anzahl an Anbietern bzw. Abnehmern existiert (Böhler 2004, S. 131). Vollerhebungen sind zudem mit verschiedenen wirtschaftlichen, zeitlichen und technischen Nachteilen verbunden. Beispielsweise sind Vollerhebungen sehr kostspielig, da sie nicht nur viel Zeit sondern auch einen großen Stab an Interviewern erfordern (Hammann und Erichson 2000, S. 126). Die Datenerhebung erfolgt daher in der Regel in Form einer Teil- bzw. Stichprobenerhebung (Stier 1999, S. 113 ff.). Eine Stichprobe ist eine der zuvor definierten Grundgesamtheit nach wissenschaftlichen Regeln entnommene Teilmenge (Sample), die im Rahmen der Untersuchung erfasst und befragt wird (Scheffler 2000, S. 63). Das Ziel einer Teilerhebung besteht darin, mit Hilfe der in der Stichprobe vorgefundenen Ergebnisse aussagekräftige Rückschlüsse auf die Grundgesamtheit zu erhalten. Im Vergleich zu Vollerhebungen lassen sich mit Teilerhebungen die Daten nicht nur schneller und billiger, sondern auch präziser gewinnen, da die Datenerhebung intensiver vorbereitet und kontrolliert werden kann (Stier 1999, S. 116).

Bei Durchführung einer Teilerhebung ist ein entsprechender Auswahlplan festzulegen (Abbildung E-1). Im ersten Schritt ist die Grundgesamtheit in sachlicher, räumlicher und zeitlicher Hinsicht abzugrenzen, indem die Untersuchungseinheiten entsprechend definiert werden (z.B. „in Deutschland in Privathaushalten lebende Personen im Alter von 16 bis 80 Jahren“; Böhler 2004, S. 132 ff.; Hammann und Erichson 2000, S. 130 ff.). Die Auswahlbasis ist eine vollständige Abbildung der Grundgesamtheit (z.B. ein Telefonbuch). Bei der Festlegung des Stichprobenumfangs sind einerseits die Kosten der Erhebung, andererseits die Genauigkeit der Ergebnisse zu berücksichtigen. Bei der Entscheidung über das Auswahlverfahren kann aus einer Fülle verschiedener zufälliger und nichtzufälliger Auswahltypen gewählt werden (siehe Abschnitt 3). Abschließend erfolgt die eigentliche Auswahl der Untersuchungseinheiten mit Hilfe des festgelegten Auswahlverfahrens.

Abbildung E-1: Ablaufschema der Stichprobengewinnung (Auswahlplan)



Quelle: Böhler 2004, S. 132

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